"The Tilt of the Earth and Seasons" Newcomer Academy Middle School Visualization Two

Chapter	Subtopic/Media	Key Points of Discussion	Notes/
1	Farth's Dotation	Deriver and Estancian of Visualization One	Vocabulary
1	Earth's Rotation and Revolution	Review and Extension of Visualization One The Earth rotates on a fixed, tilted axis.	Lesson 2 Fixed North Star Navigate Latitude
		The rotation of the Earth is ~ 24 hours, but the length of day and night <u>fluctuates</u> depending on the season (position of the Earth in its orbit around the Sun) and the latitude.	Fluctuate

2	Tracking	Sun's Position in the Sky	Lesson 3
	Shadows	High in the sky = short shadows = <u>direct</u> sunlight = heat	
			Direct
		Low in the sky = long shadows = less direct sunlight = cooler	
		Using the Analemma as a calendar and predict seasons	
		Track the Sun across the sky by displaying the following dates in	
		Uniview:	
		March 20	
		June 21	
		Sept 22	
		Dec 21	
		Restart sequence to show the <u>analemma</u> : Uniview 1 sec = 7 days	Analemma
		Scrub ahead to display path	
		+ Sun fast Equation of time (minutes) Sun slow -	
		N 16 14 12 10 8 6 4 2 0 2 4 6 8 10 12 14 24° Tropic of	
		22° J ^{utt} 10 ¹⁵ 20 25 30 3 10 12 22 Cancer	
		20° 25 20 25	
		16° 5 10 14° 30 15 5	
		10°	
		8°	
		6° 10 5	
		US 20 US	
		4° 5	
		6° 10 5	
		8° 20 0° 25	
		16° 5	
		18° 18 30 200 18 18 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	
		20° 20 22° 25 30 December 15	
		24° 5 10 16 20 2\$ 30 5 Capricon	
		S The analemma (redrawn using data from the U.S. Coast and Geodetic Survey)	
			1

3	Tilt of Earth and	Seasons	Lesson 4
	Seasons	Nearly every place on Earth has four distinct <u>seasons</u> : winter, spring, summer, and fall.	Seasons
		Seasons in the hemispheres differ. When the northern <u>hemisphere</u> is in summer, the southern hemisphere is experiencing winter.	Hemisphere
		The shape and tilt of the Earth on its axis affects the angle at which the Sun's rays pass through the <u>atmosphere</u> , and the length of daylight that an area experiences.	Atmosphere
		The Reason for the Seasons What do you think causes the seasons? The seasons <i>do not depend on the distance</i> of the Earth from the Sun. The Earth is at a closer distance to the Sun during December, when the northern hemisphere is experiencing winter.	
		Angle of Separation The higher the <u>angle</u> , the more intense the solar radiation.	Angle
		Because of the <u>curvature</u> of the Earth, sunlight strikes the poles	Curvature
		at a low angle. Rays striking Earth at a low angle must pass through more <u>atmosphere</u> . Earth's atmosphere <u>absorbs</u> and	Atmosphere
		<u>reflects</u> solar energy. The more atmosphere the rays have to pass through, the less <u>solar energy</u> reaches Earth's surface.	Absorb
		When a hemisphere of the Earth is experiencing winter the angle	Reflect
		of the Sun is lower, and when summer occurs the angle is much higher.	Solar Energy
		North Pole of the Sky East North North December 21 West	
		Sun High in the Sky = Summer Sun Low in the Sky = Winter	

4	Sun's Energy Rays of Sun and	Length of Day (Uneven Heating of Earth's Surface) The tilt of the Earth in combination with the latitude of location affects the length of the day.	Lesson 4
	Surface Temperature	Those living on the equator have 12 hours of daylight and 12 hours of darkness every day of the year.	
		If you lived at the North Pole, you would have 6 months of constant daylight from spring to fall. Unfortunately, you would encounter 24 hours of night for six months from fall to spring.	
		With more time to absorb energy from the Sun, the Earth <u>retains</u> varying amounts of heat. This uneven heating of the Earth's surface has an effect on the seasons. Long Day = Warmer Equal Day = Moderate Short Day = Colder <u>Louisville, KY: 2013 Length of Daylight</u> March 20 = (Spring) Vernal Equinox = 12 hours and 11 min June 21 = Summer Solstice = 14 hours and 49 min September 22 = (Fall) Autumnal Equinox = 12 hours and 8 m December 21 = Winter Solstice = 9 hours and 30 min	Retain
		90 90 90 90 90 90 90 90 10 10 10 10 10 10 10 10 10 1	

5	Seasons on other Planets	All of the planets have tilted axes, curved surfaces, and revolutionary paths around the Sun, which gives each the opportunity to experience seasons. Uranus is tilted almost on its side, meaning one hemisphere always has summer during half of its orbit, while the other half of it is in winter for 42 years (half of its 84 year orbit around the Sun). Even Triton, Neptune's moon, experiences summer and winter, each lasting 40 years with only a few degrees of fluctuation. Though the Sun has the greatest impact on the planets to which it is closest, The Earth is the only planet to display four distinct seasons.	Lesson 4
		27° 98° 30° 120° Obliquity of the Nine Planets © Copyright 1999 by Calvin J. Hamilton	
		Obliquity of the Nine Planets © Copyright 1999 by Calvin J. Hamilton	